REMARKS

This application has been carefully reviewed in light of the Office Action mailed on April 16, 2009. Applicant respectfully requests consideration of the foregoing amendment in light of the following remarks.

Summary of the Office Action

In the Office Action of April 16, 2009, Claims 14-16 and 19-24 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2002/0110903 to Iwaki et al. (hereinafter referred to as "Iwaki") in view of U.S. Patent No. 5,858,653 to Duran et al. (hereinafter referred to as "Duran"). Claims 14, 16, 17 and 18 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki in view of Duran and further in view of U.S. Patent No. 6,159,695 to McGovern et al. (hereinafter referred to as "McGovern"). Claims 14, 24, 25 and 26 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Iwaki in view of Duran, and further in view of the article "Microarray Sampling-Platform Fabrication Using Bubble-Jet Technology for a Biochip System" to Allain et al. (hereinafter referred to as "Allain"). No other issues were raised.

Status of the Application

Upon entry of the present amendment, claims 14, 15 and 24 will have been amended, and claims 25 and 26 will have been canceled. Accordingly, claims 1-24 remain pending in the application, with claims 1-13 being withdrawn from as drawn to a non-elected invention.

Rejection of Claims 14-16 and 19-24 under 35 U.S.C. 103(a) over Iwaki and Duran

Claims 14-16 and 19-24 were rejected under 35 U.S.C. 103(a) as allegedly being obvious over Iwaki and Duran (*see, e.g.,* pages 3-8 of Office Action). This rejection is respectfully traversed.

Claim 14 as amended is not obvious over the teaching of Duran because neither Iwaki nor Duran teach or suggest a method of immobilizing a probe that is specifically bindable to a target substance to a solid phase carrier, the method comprising:

"providing a probe having a linker containing a first functional group;
providing an immobilization substrate having a second functional group;
imparting the probe to the immobilization substrate; and
binding the first functional group of the probe and the second functional group of the immobilization substrate to each other,

wherein a combination of the first functional group and the second functional group comprises an acidic functional group and a basic functional group, and the first functional group and the second functional group are in the state of coupling without covalently bonding,

wherein the first functional group is a mercapto group, the second functional group is an amino group, the probe is a nucleic acid and the mercapto group and the amino group are directly bonded through ionic bond, and *wherein the probe is imparted to the immobilization substrate using a nozzle, which is instantaneously heated to eject the solvent containing the probe and allows the solvent to fly*" (emphasis added).

Instead, as admitted in the Office Action, "Iwaki et al and Duran et al are silent [as to] heating the nozzle of the ink jet to eject the solvent containing the probe and allowing the solvent to fly" (fourth full paragraph of page 10 of Office Action). Accordingly, as neither Iwaki nor Duran teach or suggest heating the nozzle to eject the solvent and allow the solvent to fly, the references do not

teach or suggest the method as claimed. Thus, claim 14 is considered to be patentable over the references.

Claims 15-16 and 19-23 depend from claim 14, and thus are also believed to be patentable over Iwaki and Duran for at least the same reasons as their base claim.

Claim 24 as amended similarly recites a method of immobilizing a plurality of probes that are specifically bindable to a target substance to a solid phase carrier, wherein "the probes are imparted to the immobilization substrate using a nozzle, which is instantaneously heated to eject the solvent containing the probes and allows the solvent to fly." Accordingly, as Iwaki and Duran do not teach or suggest heating a nozzle to eject solvent containing the probes and allowing the solvent to fly, it is considered that claim 24 is not obvious over the combined teachings of Iwaki and Duran.

Accordingly, the rejection of claims 14-16 and 19-24 under 35 U.S.C. 103(a) over Iwaki and Duran is respectfully requested to be withdrawn.

Rejection of Claims 14, 16, 17 and 18 under 35 U.S.C. 103(a) over Iwaki, Duran and McGovern

Claims 14, 16, 17 and 18 were rejected under 35 U.S.C. 103(a) as allegedly being obvious over Iwaki, Duran and McGovern (*see, e.g.,* pages 8-10 of Office Action). This rejection is respectfully traversed.

Claim 14 is not obvious over Iwaki and Duran because, as discussed above and as admitted in the Office Action, neither of the references teaches or suggests the method of immobilizing a probe that is specifically bindable to a target substance to a solid phase carrier as claimed, wherein "*wherein the probe is imparted to the immobilization substrate using a nozzle, which is*

instantaneously heated to eject the solvent containing the probe and allows the solvent to fly," as recited in the claim.

McGovern does not make up for these deficiencies. Instead, in the section referred to in the Office Action, McGovern teaches a type of tether that can be attached to a solid phase oligonucleotide synthesis column (column 22, lines 53-67). McGovern does not teach or suggest imparting a probe to an immobilization substrate using a nozzle that is heated to eject a solvent containing the probe, and allowing the solvent to fly, and thus McGovern also does not teach or suggest the method as recited in claim 14.

Claims 16-18 depend from claim 14, and thus are also not obvious over the cited references for at least the same reasons as their base claim.

Accordingly, the rejection of claims 14, 16, 17 and 18 under 35 U.S.C. 103(a) over Iwaki, Duran and McGovern is respectfully requested to be withdrawn.

Rejection of Claims 14, 24, 25 and 26 under 35 U.S.C. 103(a) over Iwaki, Duran and Allain

Claims 14, 24, 25 and 26 were rejected under 35 U.S.C. 103(a) as allegedly being obvious over Iwaki, Duran and Allain (*see, e.g.,* pages 10-11 of Office Action). This rejection is respectfully traversed.

Claim 14 is not obvious over the teachings of Iwaki and Duran because, as discussed above and as admitted in the Office Action, neither of the references teaches or suggests the method of immobilizing a probe that is specifically bindable to a target substance to a solid phase carrier as claimed, wherein "*wherein the probe is imparted to the immobilization substrate using a*

nozzle, which is instantaneously heated to eject the solvent containing the probe and allows the solvent to fly," as recited in the claim.

Allain does not make up for the deficiencies of the references, because Allain also does not teach or suggest imparting a *probe* to an immobilization substrate using *a nozzle that is instantaneously heated*, the probe and immobilization substrate having the mercapto and amino first and second functional groups as recited in claim 14. Instead, Allain teaches a method in which *biological samples* are deposited onto membranes using a thermal ink-jet printer, for subsequent luminescence detection (*see, e.g.,* first full paragraph of right hand column of page 146), but does not teach or suggest that a *probe* having the mercapto functional group as claimed, and that binds ionically to the claimed amino functional group of the immobilization substrate, could be advantageously imparted thereto via a heated nozzle.

That is, according to the method of Allain, *a biological sample* to be analyzed, such as the PCR-amplified genomic DNA from mice inoculated with the FHIT an E4 cell lines, is deposited by bubble-jet printing onto an immobilization membrane (*see, e.g.,* first full paragraph of right hand column of page 146). Allain further teaches that Cy5-labeled *probes* to the DNA samples were then *added to a solution and incubated* with the immobilization membrane having the DNA sample deposited thereon to hybridize the probes to the DNA sample (*see, e.g.,* sections entitled "Chemicals" and "Hybridization" of page 147). In other words, the labeled *probes* were *not deposited via bubble-jet printing*, but instead were contacted with the immobilization membrane having the DNA sample thereon *via incubation therewith in solution*. The Cy5 probe emission signal was then detected to evaluate the hybridization results (*see, e.g.* Fig. 3 and section entitled "Instrumentation" on pages 147-148). Thus, while Allain teaches using a bubble-jet printing method to deposit a *biological sample* on a membrane, Allain does not teach or suggest using such a method to deposit

probes, such as probes having the mercapto functional group as claimed that binds ionically to the amino functional group of an immobilization substrate.

In contrast, Applicant has discovered that by instantaneously heating a nozzle to eject solvent containing the *probe* as claimed, such as for example via bubble jet method, fine droplets activated by heat are applied to the surface of the immobilization substrate, thereby improving the reaction efficiency of the ionic bond formed between the probe and substrate having the mercapto and amino first and second functional groups. It is clear that Allain doesn't recognize any such advantages that may be provided in the instantaneous heating and ejection of such *probes* onto immobilization substrates. In fact, Allain even teaches that an extra step is needed to secure the DNA sample taught therein to the membrane after deposition thereof, by teaching that "[a]fter spotting, DNA was immobilized on the membrane by exposure to UV for 1 min" (*see, e.g.,* section entitled "Hybridization" on page 147). Accordingly, it is considered that one of ordinary skill in the art would *not* have been motivated to devise the method as claimed based on the teachings of Allain, because Allain does not teach or suggest any benefits in using a bubble-jet method to deposit a *probe* onto an immobilization substrate, the probe having the mercapto and amino first and second functional groups as claimed, such as for example in the improved reaction efficiency with regard to forming an ionic bond therebetween.

Claim 24 similarly recites a method of immobilizing a plurality of probes that are specifically bindable to a target substance to a solid phase carrier, wherein "the probes are imparted to the immobilization substrate using a nozzle, which is instantaneously heated to eject the solvent containing the probes and allows the solvent to fly." Accordingly it is considered that claim 24 is also not obvious over the combined teachings of Iwaki, Duran and Allain, for at least the same reasons as claim 14.

Claims 25 and 26 are being cancelled with the present amendment, and thus the rejection of these claims is rendered moot.

Accordingly, the rejection of claims 14 and 24 under 35 U.S.C. 103(a) over Iwaki, Duran and Allain is respectfully requested to be withdrawn.

CONCLUSION

Applicant respectfully submits that all of the claims pending in the application meet the requirements for patentability, and respectfully requests that the Examiner indicate the allowance of such claims. Any amendments to the claims which have been made in this response, and which have not been specifically noted to overcome a rejection based upon prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

If any additional fee is required, please charge Deposit Account Number 502456. Should the Examiner have any questions, the Examiner may contact Applicant's representative at the telephone number below.

Respectfully submitted,

7/13/2009

Date

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